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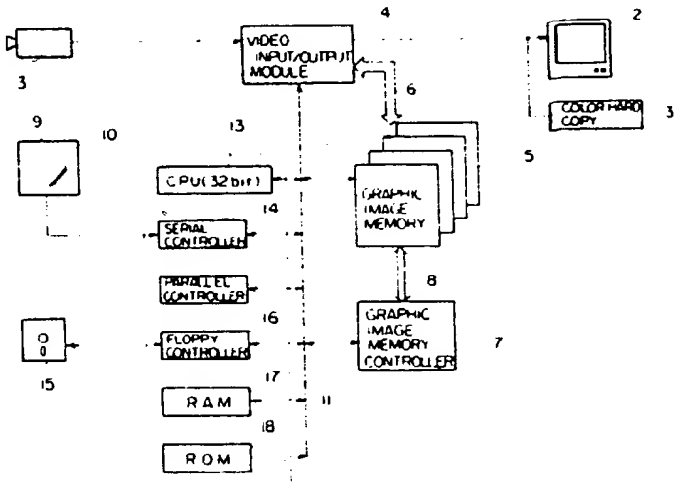
(54) Make-up simulator.

(57) A make-up simulator wherein all necessary operations can be executed in accordance with menus on a display picture and various delicate graphic image processing functions essentially required for a make-up are incorporated. In the make-up simulator, a face of an object person is digitized as a graphic image of a high quality using a color TV camera and then the graphic image thus inputted is processed is various ways including revisions and changes and combinations of colors based on the procedure of an actual make-up and then outputted to a color monitor TV set and/or a color hard copy device. The make-up simulator comprises a graphic image memory and a graphic image memory controller for controlling the graphic image memory, and a co-ordinate input device such as a tablet and a pressure sensitive stylus pen for inputting co-ordinates of a working location and a working condition of a graphic image of a face. A graphic image processing circuit executes required processings of a graphic image and controls the color monitor TV set.

FIG. 1



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The above and other objects, features and advantages of the present invention will become apparent from the following description and the appended claims, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram illustrating a general construction of a make-up simulator according to the present invention;
Fig. 2 is a schematic illustration of a picture of a color monitor TV set;
Fig. 3 is a block diagram of a video signal input/ output module;
Fig. 4 is a block diagram of graphic image memory circuits and a graphic image memory controller circuit;
Fig. 5 is a block diagram of a red memory circuit;
Fig. 6 is a block diagram of the graphic image memory controller circuit;
Fig. 7 is a flow chart of a main loop of a control program;
Figs. 8(A) and 8(B) are flow charts of a window specifying routine;
Figs. 9(A) and 9(B) are flow charts of a color palette task routine;
Figs. 10(A) and 10(B) are flow charts of a function menu task routine;
Figs. 11(A) and 11(B) are flow charts of a brush size number determining task routine;
Fig. 12 is a flow chart of a working task routine;
Fig. 13 is a flow chart of a painting routine;
Fig. 14 is a diagrammatic representation of a graphic image memory within a working graphic image window;
Fig. 15 is a flow chart of a painting routing for a picture element;
Fig. 16 is a diagrammatic representation of a graphic image memory;
Fig. 17 is a flow chart of a brushing routine;
Fig. 18 is a flow chart of a chalking routine;
Fig. 19 is a flow chart of a washing routine;
Fig. 20 is a flow chart of a copying routine;
Fig. 21 is a flow chart of a mixing routine;
Fig. 22 is a flow chart of an erasing routine;
Fig. 23 is a flow chart of a mask producing routine;
Figs. 24(A) and 24(B) are schematic illustrations of a masking working;
Fig. 25 is a flow chart of a color changing routine;
Figs. 26(A), 26(B) are 26(C) are schematic illustrations of a color changing working;
Figs. 27 is a flow chart of a scaling routine;
Figs. 28(A), 28(B) and 28(C) are schematic illustrations of a scaling working;
Fig. 29 is a flow chart of a mirroring routine;
Figs. 30(A) and 30(B) are schematic illustrations of a mirroring working;
Fig. 31 is a flow chart of a composing routine; and
Figs. 32(A), 32(B), 32(C) and 32(D) are schematic illustrations of a composing working.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to Fig. 1, a make-up simulator according to the present invention comprises a three-tube type color TV camera 1 as an example of an image pickup device for inputting an original graphic image of a face of an object person to the make-up simulator therethrough. The make-up simulator further comprises a color monitor TV set 2 as a display unit for displaying thereon a graphic image of the face during or after working. Since the color monitor TV set 2 makes a display in a non-interlacing scanning output mode, a bright, non-flickering graphic image can be attained, and hence the color monitor TV set 2 is suitable for demonstration at the shop-front. In order to convert output signals of the TV camera into non-interlaced signals, the color monitor TV set 2 contains a scan converter circuit therein. The make-up simulator further comprises a color hard copy device 3 for fixing a worked graphic image to a face of a sheet of paper to be distributed to a customer, and a video signal input/output module 4 which in turn contains therein an analog to digital (A/D) converter 101 fr digitizing video signals inputted by way of the color TV camera 1 to form original dot data and a digital to analog (D/A) converter 102 for converting worked dot data into analog

through which a color for coloring is specified and which includes 20 color palettes 22a in the display picture shown in Fig. 2. One of the color pallettes 22a is selected by the spot 21 to input the same to the CPU. A similar inputting method also applies to following windows. The windows further include an additive color amount determining window 23 including a bar graph for specifying the density to be colored, and a pen size specifying window 24 for specifying a circle of a predetermined radius in order that picture elements (dots) within a circle of the predetermined radius around a point of co-ordinates selected by the spot 21 may be worked collectively with same conditions. The circle corresponds to the size of a brush for an actual make-up, and the pen size specifying window 24 shown in Fig. 2 includes four such circles to allow selection of one of four pens which are different in size from each other. A pen having a smaller size will allow a more delicate working. The windows further include a function menu window 25 for selecting a sort of a working therethrough. Details of various workings will be described below.

(1) Painting

Picture elements are daubed in a color.

(2) Brushing

Picture elements are repetitively colored. This is a graphic image retouching function and is suitable to provide intensity in an edgewise direction or to provide shading. This is considered important also in an actual make-up.

(3) Chalking

This is called random tiling and colors a plurality of dots at random. This is necessary for making up an eyebrow or an eye. This resultantly allows spotted coloring. Or otherwise, this will result in coloring like pointillism.

(4) Washing

This corresponds to washing off of the make-up and changes the color while maintaining the brightness (tone) of a current color in order to restore a color of the bare skin.

(5) Copying

Part of a graphic image is transferred to another part. This is used, for example, to transplant or remove a mole.

(6) Mixing

Colors of adjacent dots are averaged to make the texture finer.

(7) Erasing

A worked graphic image is cancelled and an original graphic image is restored.

(8) Mask Production

A pattern of, for example, a mouth or hair is cut out from an original graphic image to produce a mask.

(9) Color Changing

The color of a graphic image within a designated mask is collectively changed into a designated color. This is used for co-ordination.

(10) Scaling (Enlargement/Reduction)

A graphic image is partially enlarged or reduced in the X or Y direction.

(11) Mirroring

A graphic image is turned left side right. This is used to produce a condition of a face reflected by a mirror.

(12) Composing

A mask pattern is replaced by another to facilities selection of a hair style or the like. This is used for co-ordination.

In summary, at first a color palette, an additive color amount, a pen size and a function are determined by the spot 21, and then the spot 21 is moved to a desired location of a worked graphic image 20 to execute an intended working or make-up. Since all necessary operations can be executed with menus on the display picture in this manner, the operability is high. Besides, since all working functions required for an actual make-up are involved, delicate and fine simulation is available.

Now, operation of the make-up simulator according to the present invention will be described in detail with reference to flow charts shown in the accompanying drawings.

Fig. 7 is a flow chart of a main loop of the entire make-up simulator. Referring to Fig. 7, at first co-ordinates (X = HHH, Y = VVV) of a point inputted by way of the tablet are read, and then it is determined to which window the co-ordinates belong. Here, in case a flag W = 0, the co-ordinates (X, Y) belong to the color palette window 22, and accordingly a color pallet task is executed to specify a color for coloring. In case W = 1, the co-ordinates (X, Y) belong to the function menu window 25, and accordingly a function menu task is executed to specify contents of a working. It is to be noted that in case of a working which is independent of any other working, the working is executed subsequently by a direct command executing task therefor. In case W = 2, the co-ordinates (X, Y) belong to the pen size specifying window 24, and

$$R_T^T = \frac{R_S(100-INT) + R_C \cdot INT}{100} \quad \cdots\cdots\cdots\cdots (1)$$

(while the equation (I) above provides for calculation for the red color, calculation for the two other primary colors is similar to this.)

The dot color data (R_T, G_T, B_T) thus obtained are then written into cells of an address (X_C, Y_C) within a working (target) graphic image area 30 of the graphic image memory. Here, where the additive color rate INT is 100%, the dot is completely painted with the color of the designated color palette, but if the additive color rate INT is 50%, then the dot is painted with a color of a mixture of equal amounts of the original color and the color of the designated color palette.

Fig. 17 shows a flow chart of a brushing routine. Since the brushing routine is similar to the painting routine, description will be given only of a difference, that is, an equation (2) in a routine for executing brushing of a single picture element. This also applies to flow charts for other functions shown in Figs. 18 to 22.

Flow chart of a Brushing Routine of Fig. 17 Equation (2)

$$R_T = \frac{R_T'(100-INT) + R_C \cdot INT}{100}$$

Here, R_T' is used instead of R_S in the equation (I) for painting. R_T' is a color data of a worked graphic image before brushing.Accordingly, R_T can be renewed by repetitive brushing, and after all, this corresponds to lap painting.

Flow chart of a Chalking Routine of Fig. 18 Equation (3)

$$R_T = \frac{R_S(100-INT) + R_C \cdot INT}{100}$$

(Here, (X_C, Y_C) are selected from a table of random numbers.) The equation (3) is the same as the equation (I) above for painting, but here, only when the co-ordinates (X_C, Y_C) of an object dot are selected at random from a table of random numbers, coloring is executed. Thus, random tiling is performed.

Flow chart of a Washing Routine of Fig. 19 Equation (4)

$$R_T = \frac{R_C \times GL}{EE}$$

Provided, however,

$$G_L = \frac{AA \times R_T' + BB \times G_T' + CC \times B_T'}{DD}$$

(here, AA, BB, CC, DD and EE are constants.) GL represents a brightness (tone) of a dot of the precedingly worked graphic image. Accordingly, GL is a white-black data, and this is multiplied by the color data R_C of the selected color palette in order to restore a flesh color.

Flow Chart of a Copying Routine of Fig. 20 Equation (5)

Since a large capacity graphic image memory is employed, a very large number of colors can be reproduced and hence a delicate color tone can be attained.

Since a pressure sensitive stylus pen is used, the make-up simulator is compatible with software for natural touch such as brushing.

Since all necessary operations can be done with menus on the picture without using a CRT terminal or the like, the operability is high.

Since the input layout is of the multi-window type, a picture layout easy to use can be attained.

Since the make-up simulator involves a brushing function based on a precedure of an actual make-up, it is suitable for a make-up.

The composing function and the color changing function can be utilized for co-ordination.

Having now fully described the invention, it will be apparent to one of ordinary skill in the art that many changes and modifications can be made thereto without departing from the spirit and scope of the invention as set forth herein.

Claims

I. A make-up simulator, comprising a color image pickup device for converting an original graphic image of a face of an object person into input video signals, a color display unit for reproducing worked output video signals as a worked graphic image of a face, a video signal input/output module connected to said color image pickup device and said color display unit for converting input video signals into dot data and for converting worked dot data into output video signals, a graphic image memory connected to said video signal input/output module by way of a dot data bus for storing dot data therein, a graphic image memory controller connected to said graphic image memory by way of a memory bus for controlling reading out of and writing into said graphic image memory, a co-ordinate input device for inputting co-ordinates of a working location and a working condition of a graphic image of a face, and a graphic image processing circuit coupled to said graphic image memory controller and said co-ordinate input device by way of a system bus for receiving dot data from said graphic image memory controller in response to inputted working location co-ordinates, selectively executing a working of painting, brushing, chalking, washing, copying, mixing or erasing of dot data in accordance with the inputted working condition and then delivering dot data thus worked to said graphic image memory controller and for controlling indication on said display unit of a location of co-ordinates inputted from said co-ordinate input device.

2. A make-up simulator according to claim I, wherein said color display unit is a color monitor TV set of the non-interlacing type.

3. A make-up simulator according to claim I, wherein said color display unit displays an original graphic image of a face and a worked graphic image of the face in a juxtaposed relationship thereon.

4. A make-up simulator according to claim I, wherein said graphic image memory includes a large capacity semiconductor memory device.

5. A make-up simulator according to claim I, wherein said graphic image processing circuit includes a 32-bit processor therein and executes a high speed calculating operation.

6. A make-up simulator according to claim I, wherein said co-ordinate input device includes a tablet and a stylus pen of the pressure sensitive type.

7. A make-up simulator according to claim 6, wherein said tablet is divided into a function menu window for inputting contents of a working therethrough, a window for specifying a size of a pen therethrough, a color pallet window for designating therethrough a color to be colored, and a window for specifying an amount of coloring therethrough, and said windows are displayed on said display unit.

8. A make-up simulator according to Claim I, wherein said graphic image processing circuit additionally performs production of a mask, changing of a color and composition in response to an instruction given by way of said co-ordinate input device.

FIG. 2

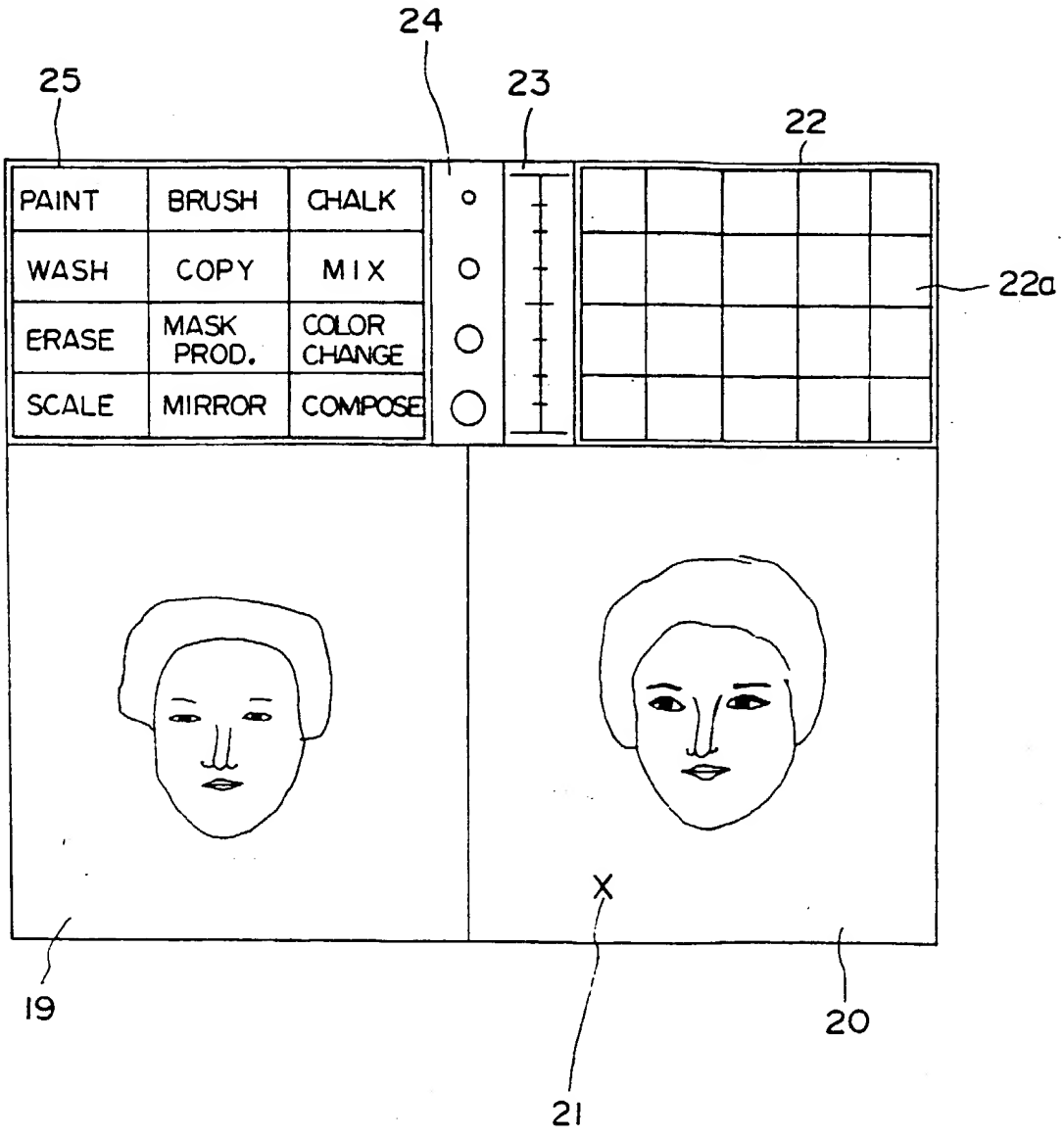

24
25
23
22
PAINT
BRUSH
CHALK
WASH
COPY
MIX
ERASE
MASK PROD.
COLOR CHANGE
SCALE
MIRROR
COMPOSE
22a
X
19
20
21

FIG. 4

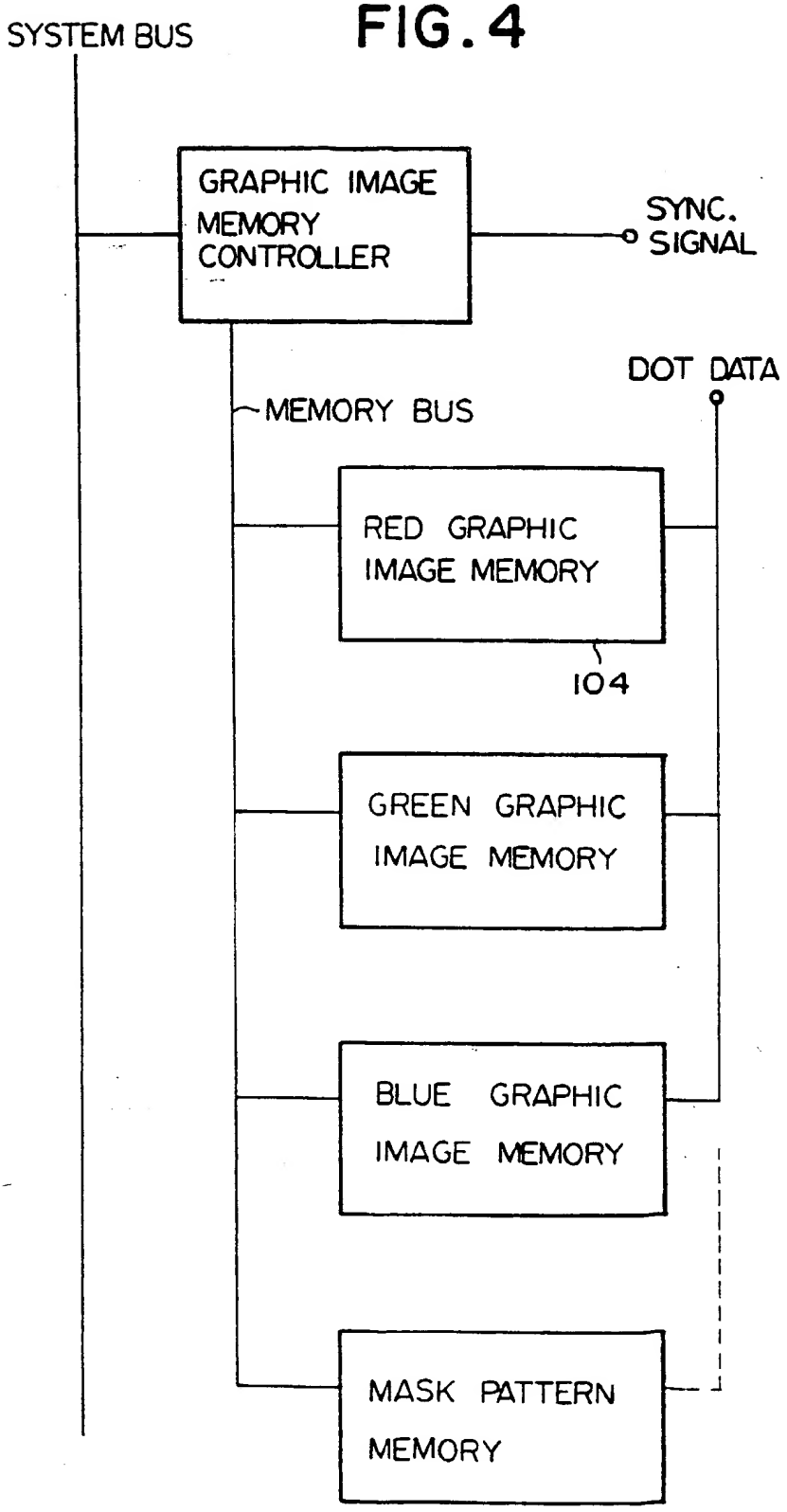

SYSTEM BUS
GRAPHIC IMAGE MEMORY CONTROLLER
SYNC. SIGNAL
DOT DATA
MEMORY BUS
RED GRAPHIC IMAGE MEMORY
104
GREEN GRAPHIC IMAGE MEMORY
BLUE GRAPHIC IMAGE MEMORY
MASK PATTERN MEMORY

FIG. 6

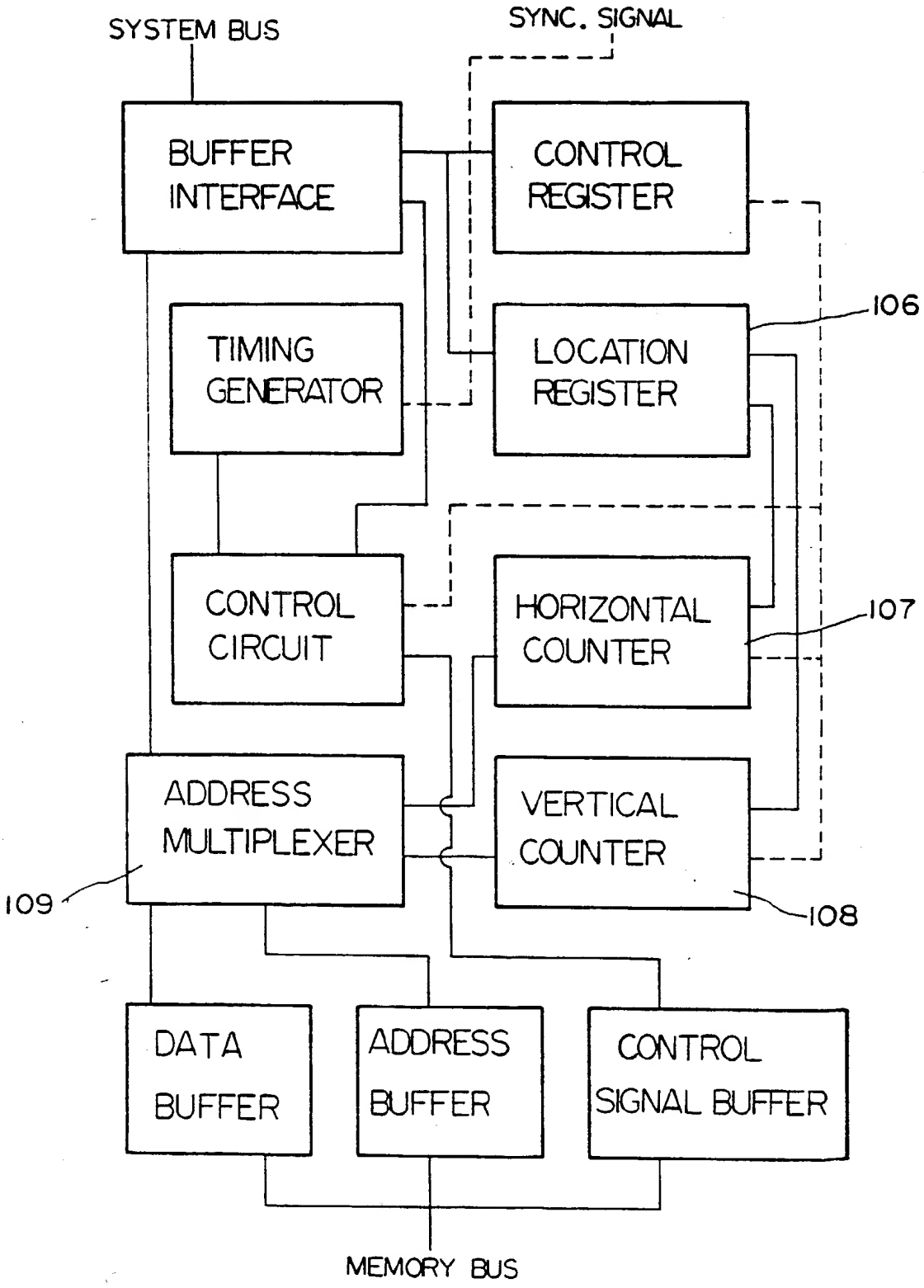

SYSTEM BUS
SYNC. SIGNAL
BUFFER INTERFACE
CONTROL REGISTER
TIMING GENERATOR
LOCATION REGISTER
106
CONTROL CIRCUIT
HORIZONTAL COUNTER
107
ADDRESS MULTIPLEXER
VERTICAL COUNTER
109
108
DATA BUFFER
ADDRESS BUFFER
CONTROL SIGNAL BUFFER
MEMORY BUS

FIG. 8(A)

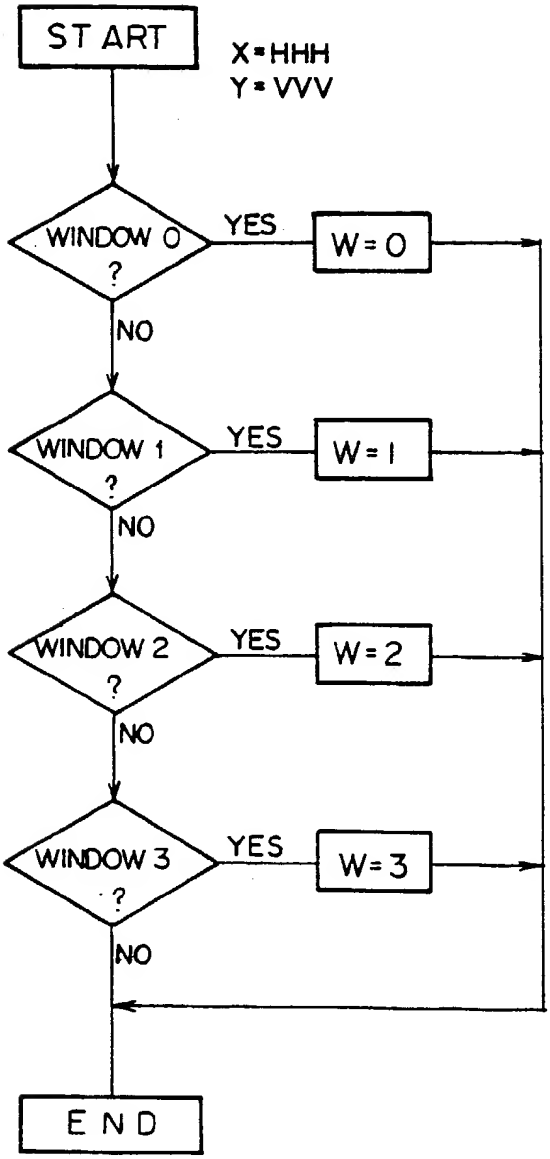

START
X=HHH
Y=VVV
WINDOW 0 ?
YES
W=0
NO
WINDOW 1 ?
YES
W=1
NO
WINDOW 2 ?
YES
W=2
NO
WINDOW 3 ?
YES
W=3
NO
END

FIG. 8(B)

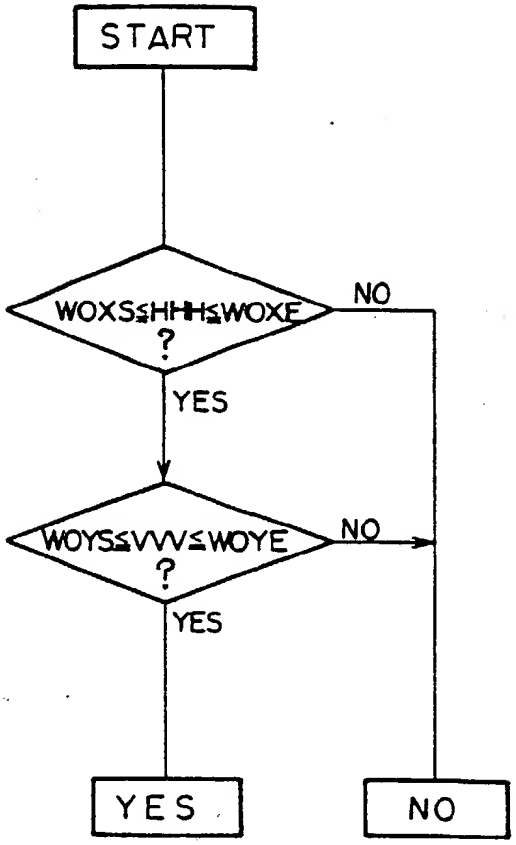

START
WOXS≦HHH≦WOXE ?
NO
YES
WOYS≦VVV≦WOYE ?
NO
YES
YES
NO

FIG. 10 (A)

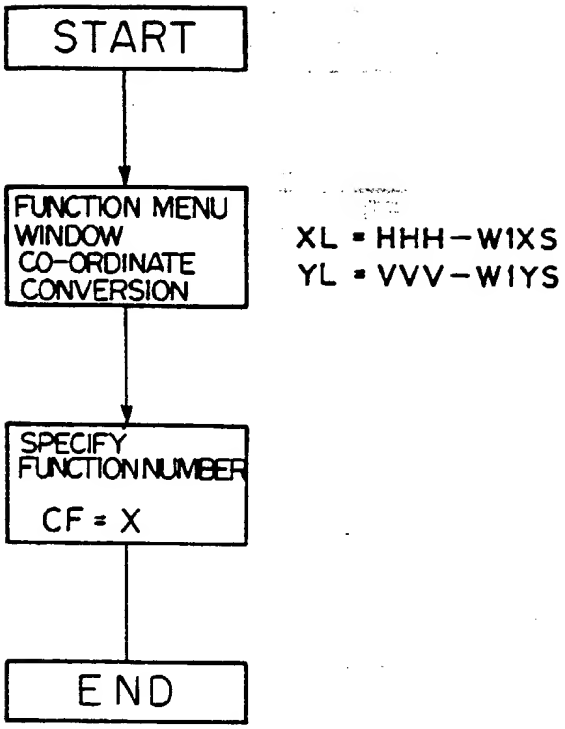


FIG. 10 (B)

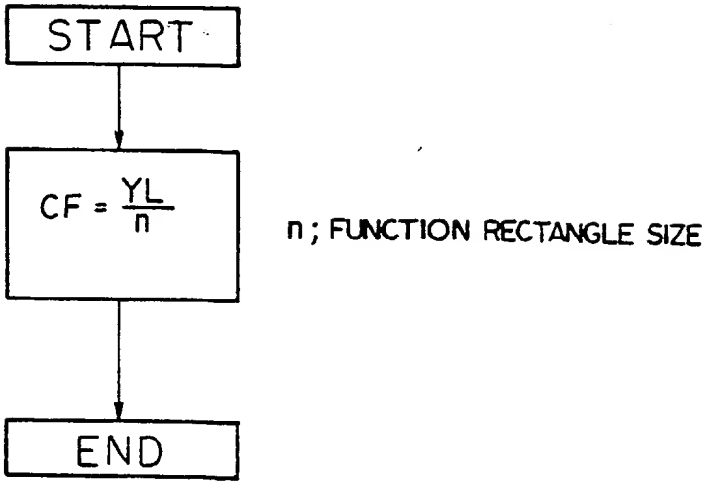


FIG. 12

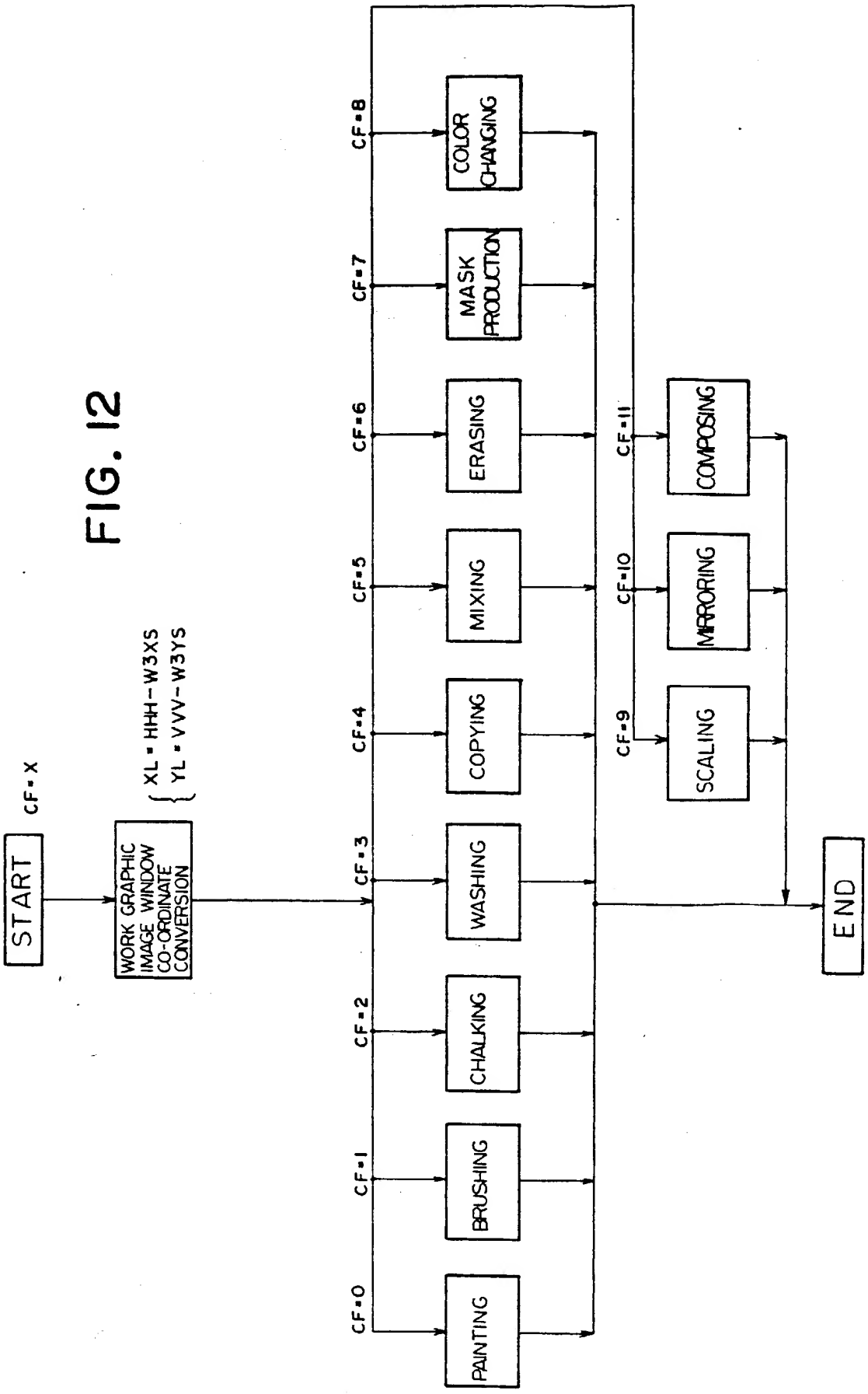

START
CF = X
WORK GRAPHIC IMAGE WINDOW CO-ORDINATE CONVERSION
XL = HHH - W3XS
YL = VVV - W3YS
CF=0
PAINTING
CF=1
BRUSHING
CF=2
CHALKING
CF=3
WASHING
CF=4
COPYING
CF=5
MIXING
CF=6
ERASING
CF=7
MASK PRODUCTION
CF=8
COLOR CHANGING
CF=9
SCALING
CF=10
MIRRORING
CF=11
COMPOSING
END

FIG. 14

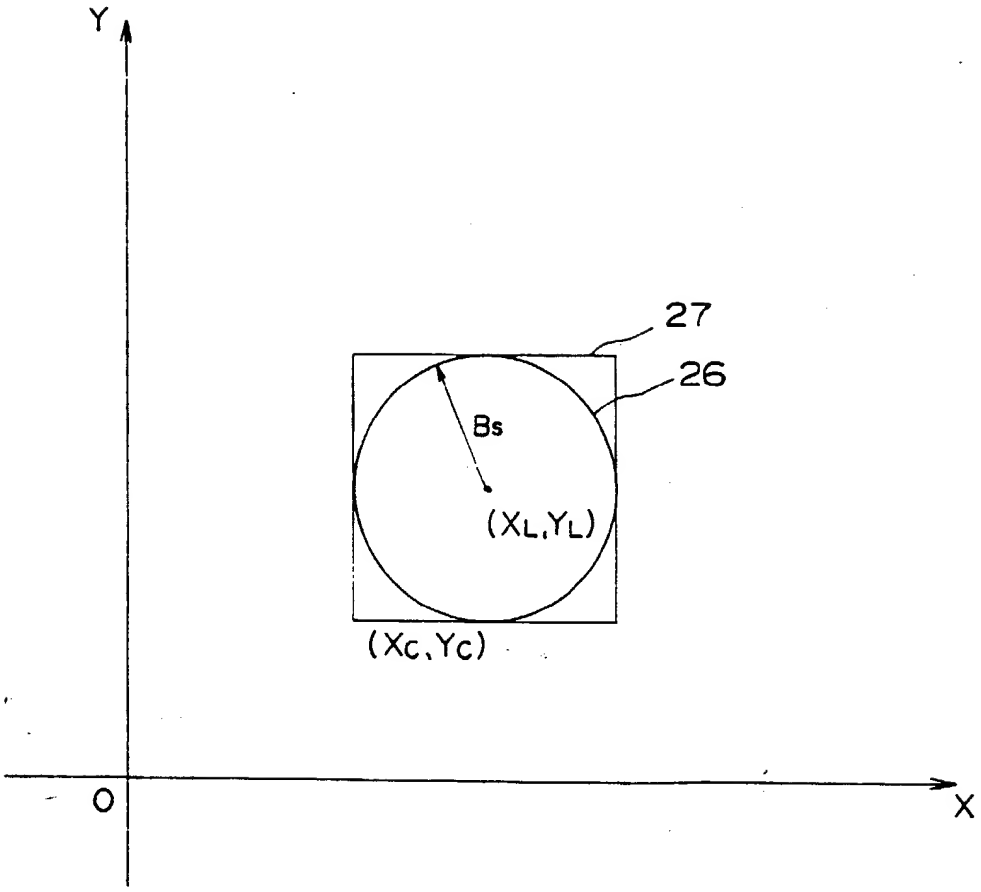


FIG. 16

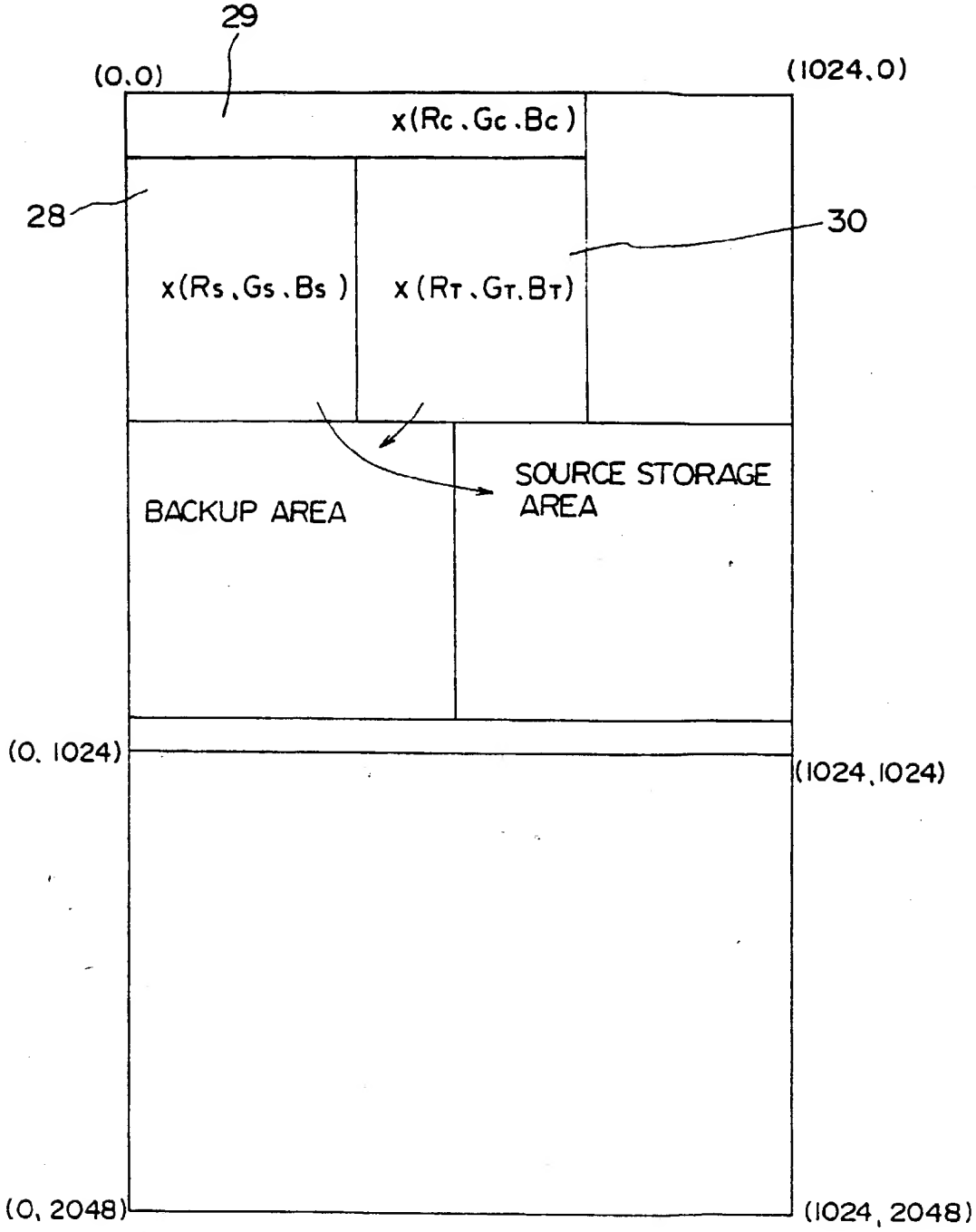

29
(0,0)
(1024,0)
x(Rc, Gc, Bc)
28
30
x(Rs, Gs, Bs)
x(RT, GT, BT)
BACKUP AREA
SOURCE STORAGE AREA
(0, 1024)
(1024, 1024)
(0, 2048)
(1024, 2048)

FIG. 18

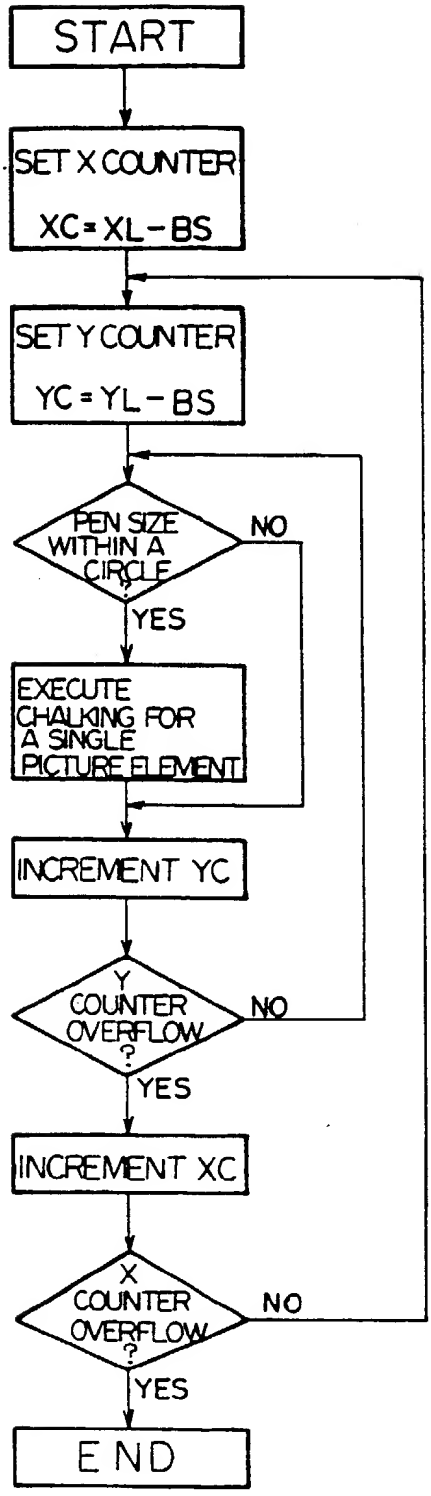

START
SET X COUNTER
XC = XL - BS
SET Y COUNTER
YC = YL - BS
PEN SIZE WITHIN A CIRCLE ?
NO
YES
EXECUTE CHALKING FOR A SINGLE PICTURE ELEMENT
INCREMENT YC
Y COUNTER OVERFLOW ?
NO
YES
INCREMENT XC
X COUNTER OVERFLOW ?
NO
YES
END

FIG.20

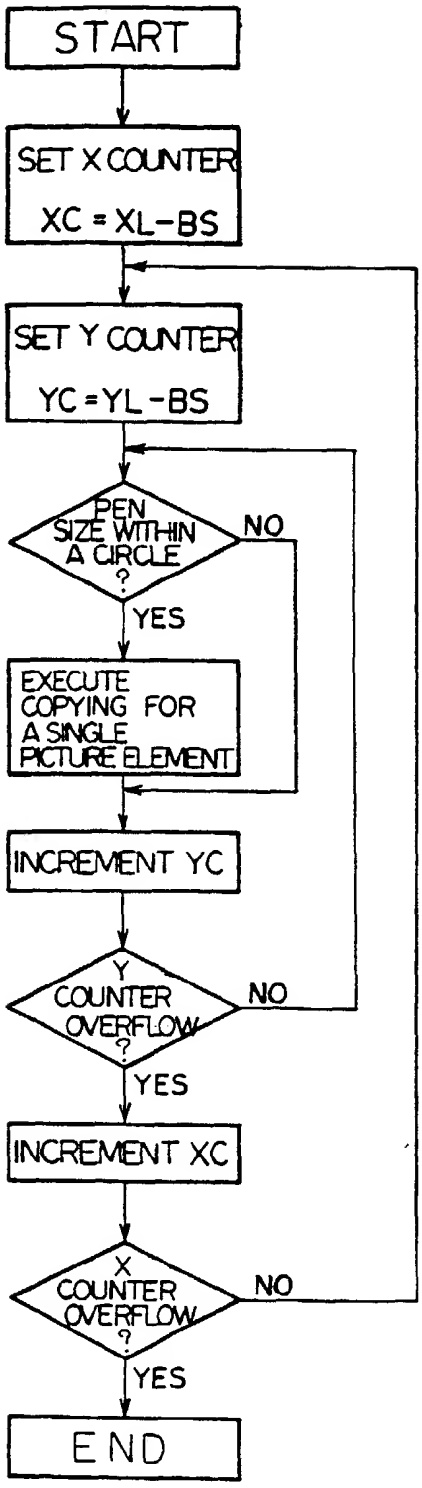

START
SET X COUNTER
XC = XL-BS
SET Y COUNTER
YC = YL-BS
PEN SIZE WITHIN A CIRCLE ?
NO
YES
EXECUTE COPYING FOR A SINGLE PICTURE ELEMENT
INCREMENT YC
Y COUNTER OVERFLOW ?
NO
YES
INCREMENT XC
X COUNTER OVERFLOW ?
NO
YES
END

FIG. 22

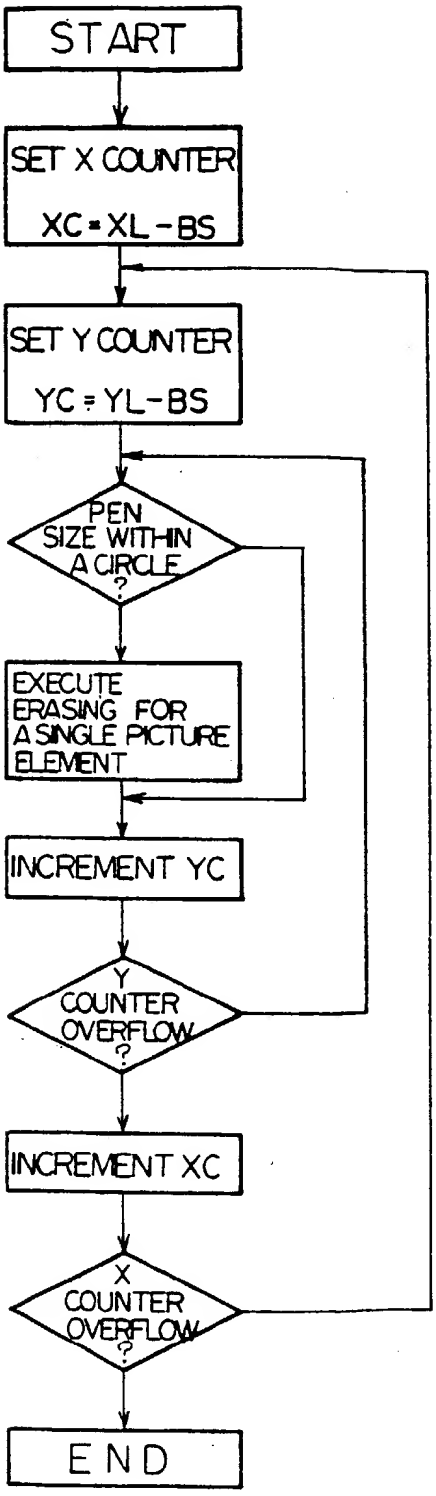

START
SET X COUNTER
XC = XL - BS
SET Y COUNTER
YC = YL - BS
PEN SIZE WITHIN A CIRCLE ?
EXECUTE ERASING FOR A SINGLE PICTURE ELEMENT
INCREMENT YC
Y COUNTER OVERFLOW ?
INCREMENT XC
X COUNTER OVERFLOW ?
END

FIG. 24(A)

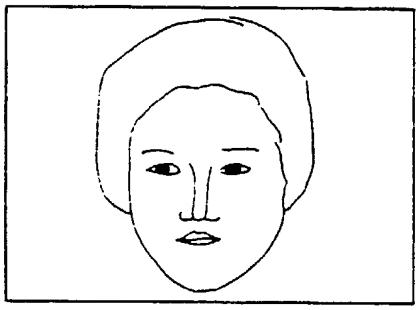


FIG. 24(B)

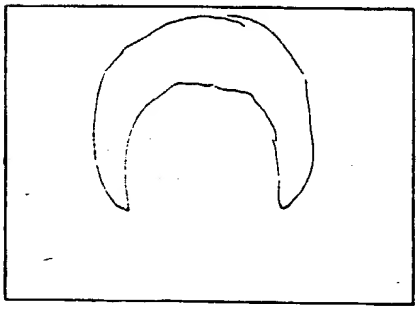


FIG. 25

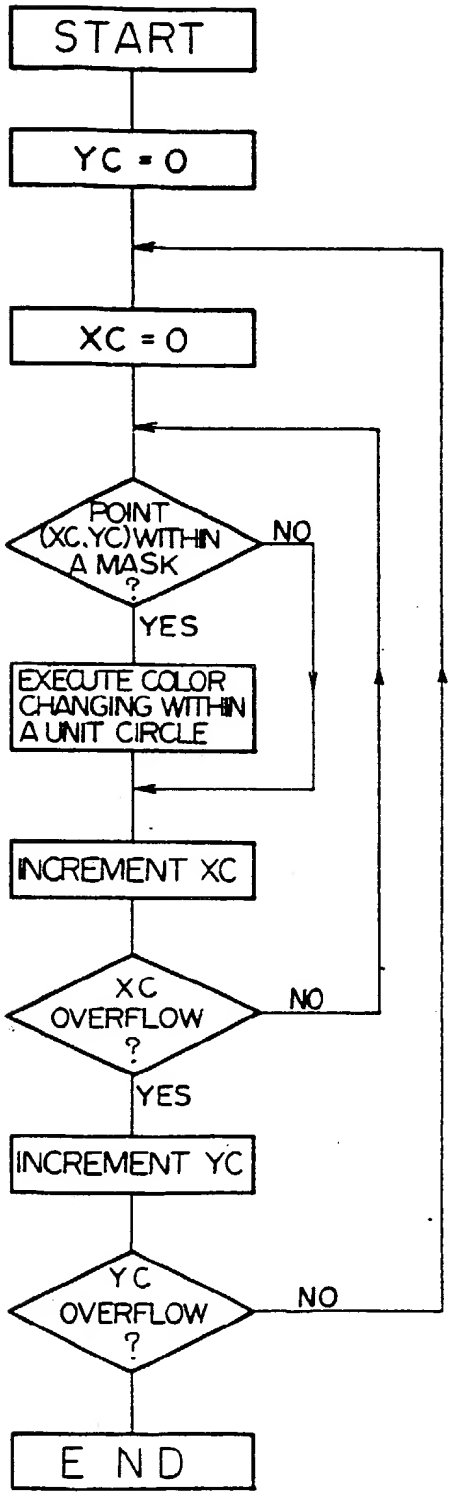


FIG. 27

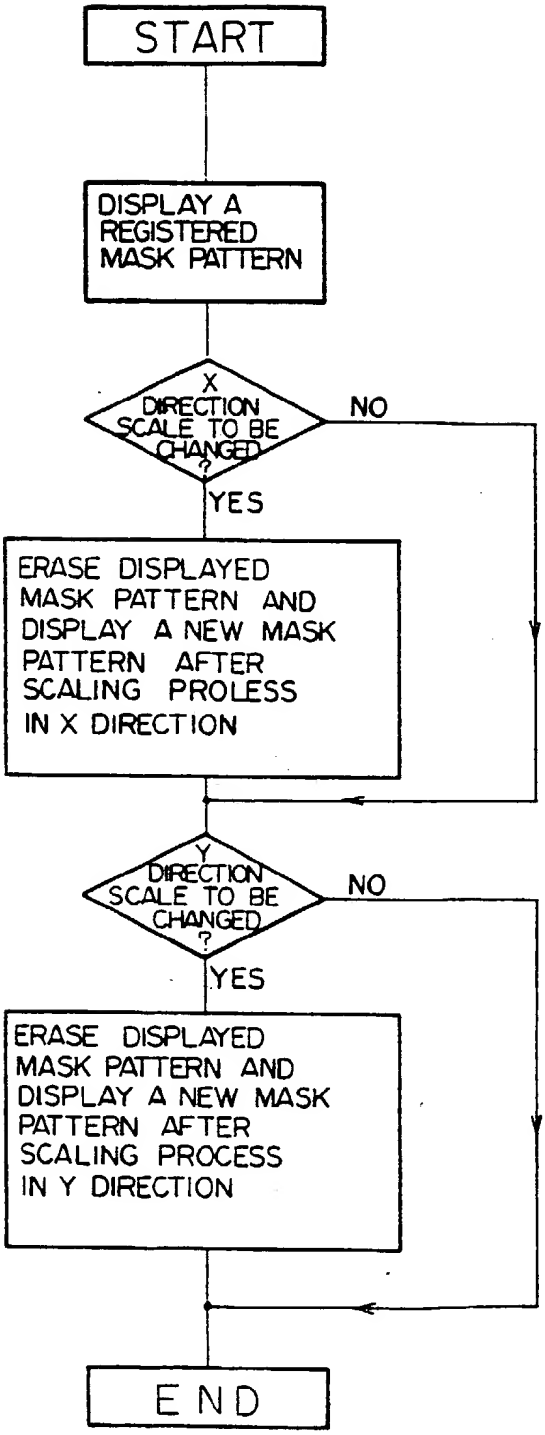

START
DISPLAY A REGISTERED MASK PATTERN
X DIRECTION SCALE TO BE CHANGED ?
NO
YES
ERASE DISPLAYED MASK PATTERN AND DISPLAY A NEW MASK PATTERN AFTER SCALING PROLESS IN X DIRECTION
Y DIRECTION SCALE TO BE CHANGED ?
NO
YES
ERASE DISPLAYED MASK PATTERN AND DISPLAY A NEW MASK PATTERN AFTER SCALING PROCESS IN Y DIRECTION
END

FIG.29

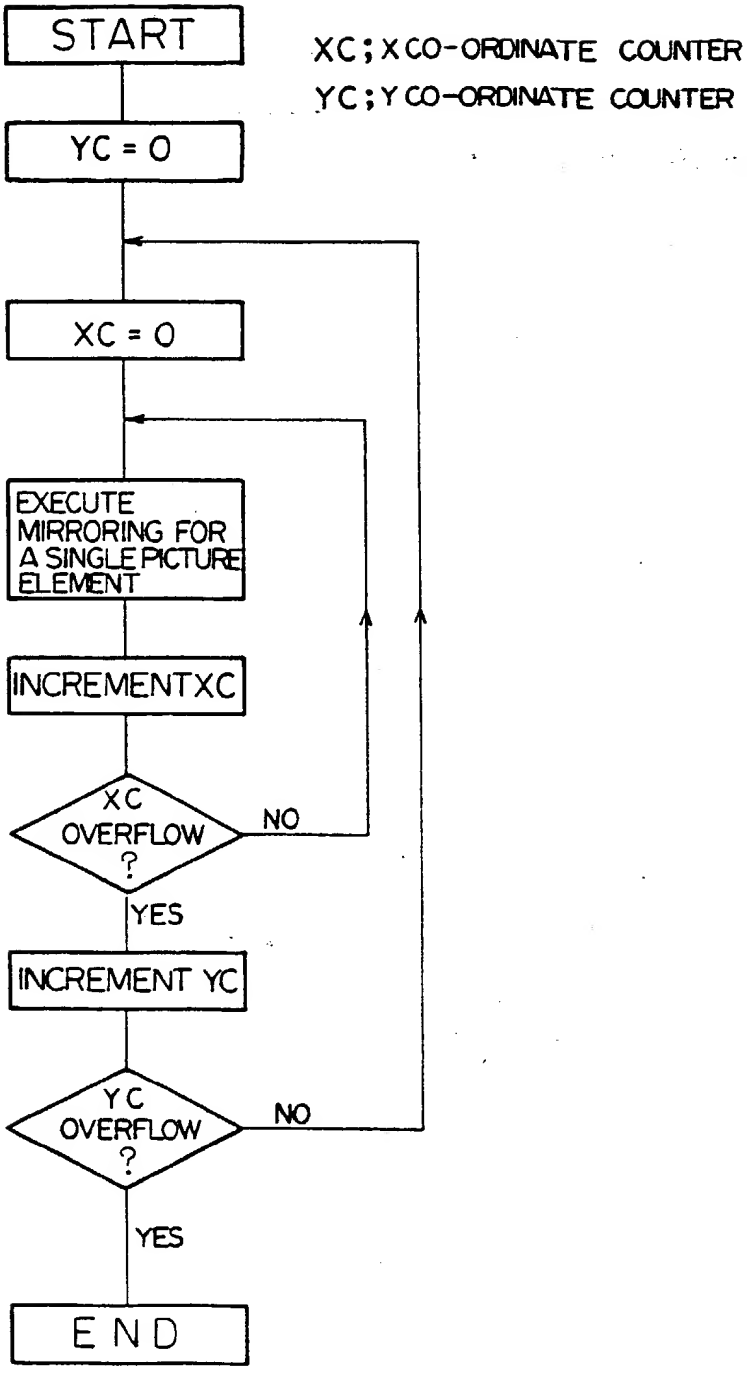

START
XC;X CO-ORDINATE COUNTER
YC;Y CO-ORDINATE COUNTER
YC = 0
XC = 0
EXECUTE MIRRORING FOR A SINGLE PICTURE ELEMENT
INCREMENTXC
XC OVERFLOW ?
NO
YES
INCREMENT YC
YC OVERFLOW ?
NO
YES
END

FIG. 32(A)

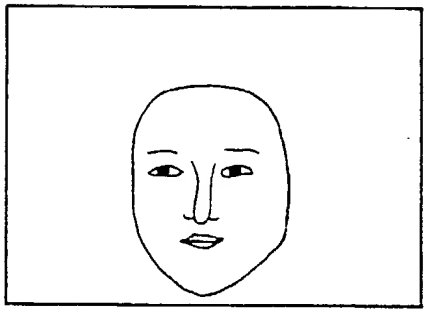


FIG. 32(C)

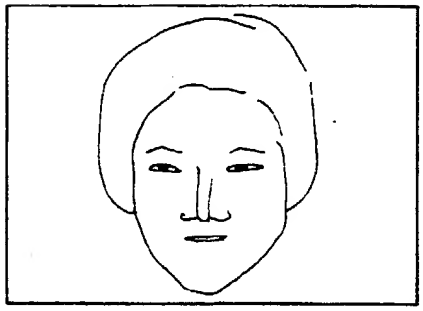


FIG. 32(D)

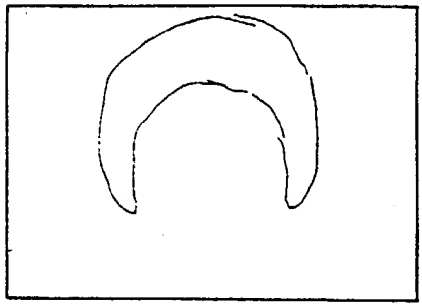
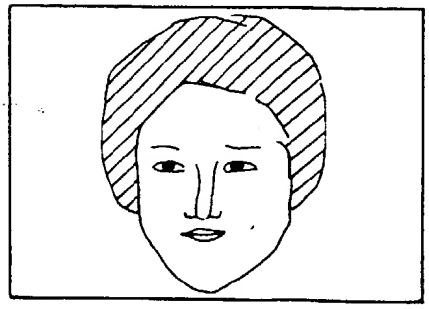


FIG. 32(B)



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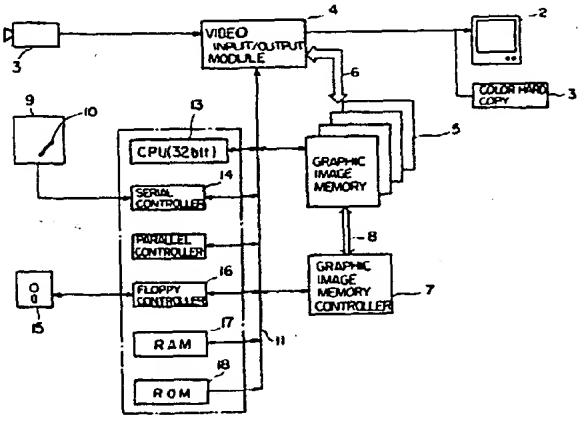
(54) Make-up simulator.

(57) A make-up simulator wherein all necessary operations can be executed in accordance with menus on a display picture and various delicate graphic image processing functions essentially required for a make-up are incorporated. In the make-up simulator, a face of an object person is digitized as a graphic image of a high quality using a color TV camera and then the graphic image thus inputted is processed is various ways including revisions and changes and combinations of colors based on the procedure of an actual make-up and then outputted to a color monitor TV set and/or a color hard copy device. The make-up simulator comprises a graphic image memory and a graphic image memory controller for controlling the graphic image memory, and a co-ordinate input device such as a tablet and a pressure sensitive stylus pen for inputting co-ordinates of a working location and a working condition of a graphic image of a face. A graphic image processing circuit executes required processings of a graphic image and controls the color monitor TV set.

FIG. 1



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